Chico
Golden Empire Amateur Radio Society, Inc.

"Dedicated to Public Service"

THE RADIATOR

SPECIAL SERVICE CLUB

W6RHC
IRLP #8170

www.gearsw6rhc.org
P.O.Box 202 Chico, CA 95927

February 2022 Newsletter	GEARS Founded August 13, 1939

Greetings from the President……

So here we are in February. There are lots of little characters roving around with bows and arrows creating havoc with the hearts of young and old alike. Forty-five years ago one of those arrows hit me and Mrs. Stewart and we were married. That turned out to be the best decision, by far, in which I was ever involved. I am so thankful for all these wonderful years. Thank you Becki.

January came and went quickly. The last few days have been so nice, the afternoons sitting outside sharing the warm sunlight with my wife and neighbor have been fantastic. We had a good meeting this month with Kent Hastings, WA6ZFY, sharing about Reverse Beacons. What another great tool for verifying the propagation of our signals. Along with the use of regular Beacons, Reverse Beacons and WEB based SDR we should be able to get a very accurate indication of how effective our signal is just about anywhere at any time. Thank you Kent.

We, the board and I. would love to hear your ideas as to meeting topics. This is your club so YOUR INPUT is important. Please feel free to share with me or any board member your thoughts on topics to be explored at our meetings. If you would like to share as a presenter we would love to hear from you.

In the near future we will have a night of HOME BREW projects. If you are working on a radio project or something related please plan to share with us what you are doing (date to be announced). Also, in the near future we will be holding an Auction. It is my understanding there are LOTS of great items to be sold. I have attended only one of our GEARS auctions, it was a really great time and I picked up some small but very useful items.

Have a great February, be careful, be healthy, and be especially watchful of those arrows

'73
Paul Stewart N6PAS
n6pas1@gmail.com

Join GEARS on Facebook www.facebook.com For timely news and additional information.

February 2022 Calendar

Sun	Mon	Tue	Wed	Thu	Fri	Sat
		1 7pm PARS Net 7:30pm GEARS Net	2	3 7:30pm Simplex Net	4	5
6 8pm OARS Net 2pm VEC Testing	7 7pm GARS Net 8pm ARES Net	8 7pm PARS Net 7:30pm GEARS Net	9	10 7:30pm Simplex Net	11 7pm OARS meeting 7pm GARS meeting	12 9am Chico Breakfast
13 8pm OARS Net	14 7pm GARS Net 8pm ARES Net	15 7pm PARS Net 7:30pm GEARS Net	16	17 7:30pm Simplex Net	18 7pm GEARS Meeting	19
20 8pm OARS Net	21 7pm GARS Net 8pm ARES Net	22 7pm PARS Net 7:30pm GEARS Net	23	24 7:30pm Simplex Net	25	26 9am OARS Breakfast
27 8pm OARS Net	28 7pm GARS Net 8pm ARES Net					

VEC Testing, FCC License Exam available by appointment. For information or registration call Tom Rider, W6JS 530-514-9211
Chico Breakfast 2nd Saturday 9am Farmers Skillet Cohasset Rd, Chico
GEARS Board Meeting 1st Monday 7pm by zoom.
PARS Meeting 2nd Thursday 6:30pm, doors open 6pm Old Magalia Community Resource Center
OARS Meeting Second Friday of the month, St. Pauls Episcopal Church Hall, Oroville.
GARS Meeting Second Friday of the month, Lutheran Church Hall, Artois.
Butte ARES Meeting 3rd Tuesday, TBD Contact Dale Anderson, KK6EVX 826-3461 for more information.
GEARS Meeting, 3rd Friday of the month, Eyeball QSO 6pm, meeting at 7:00 pm. Search & Rescue Building
OARS Breakfast 4th Saturday of the month, at Cornucopia of Oroville.

NETS:
OARS Club Net Sunday 8pm 146.655 Mhz - PL 136.5
GARS Club Net Monday,7:00 pm 147.105 MHz + PL 110.09, secondary: 146.850 MHz-PL 110.9
Butte ARES Net Mondays 8pm 145.290 MHz - PL 110.9
Yuba Sutter Club Net Monday 7pm 146.085 MHz + PL 127.3
GEARS Club Net Tuesdays 7:30 PM 146.850 MHz - PL 110.9
PARS Club Net Tuesday 7pm 145.290 - PL 110.9
Simplex Net Thursday 7:30 p.m. 146.52 no tone
Yuba Sutter ARES Net Thursdays 7pm 146.085 MHz + PL 127.3
Sacramento Valley Traffic Net Nightly 9:00 PM 146.850 MHz - PL 110.9

GEARS Century Members
Dale Anderson, Kathy & Michael Favor
Kent Hastings, Bennett Laskey, Jim Van Sickle
We thank these members for their extra support.

GEARS NEWS

We have been experiencing some intermittent problems with the GEARS West Repeater on Mt. St. John. This is probably due to ice on the antenna. If you have experienced problems with our repeaters, please report by email gearsw6rhc@gmail.com.

In January ARES and CERT members participated in a test of Butte County's new AlertFM system. This system is designed to alert residents of wildfire threat and public safety power shutoff, independent of the cell phone system. It uses a subcarrier data signal on an existing FM radio station. Members discovered many dead spots where the test alert wasn't received. AlertFM engineers are working on the issues.

For more information see: https://www.alertfm.com/ and https://www.buttecounty.net/Portals/0/Documents/PSPS/AlertFM

At the January GEARS meeting, Kent Hastings, WA6ZFY, gave a great presentation on Reverse Beacons. A Wikipedia article about conventional amateur radio beacon transmitters (testing propagation), including the text "In the US, unattended beacons on frequencies lower than the 10-meter band are not legal" (but not restricting foreign beacons), is found here, https://en.wikipedia.org/wiki/Amateur_radio_propagation_beacon

A list of international radio beacons using CW is included in this article, https://en.wikipedia.org/wiki/International_Beacon_Project

An SDR waterfall display of all received signals on the 40 meter CW band can be seen here, http://websdr1.sdrutah.org:8901/index1a.html?tune=7032lsb

List of "skimmer" receiving stations reporting a particular callsign sending CW can be obtained at the Reverse Beacon Network, http://www.reversebeacon.net/

For those using FT8, JS8call or other digital modes, get a worldwide map of stations receiving a particular callsign at PSK Reporter, https://pskreporter.info/

Superheterodyne, SDR, Hybrid SDR: Which is Best?

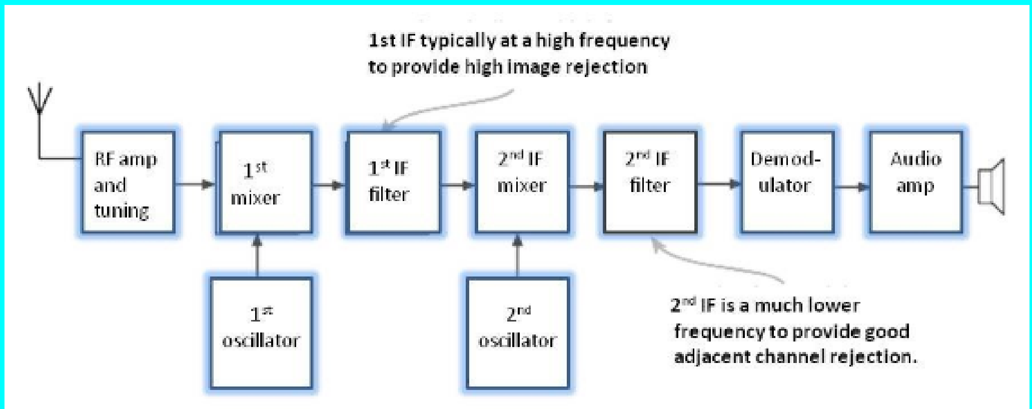
Mark Haverstock, K8MSH from OnAllBands.com

Software Defined Radios (SDR) have become popular with hams over the last few years. Many own one, and those who don't have certainly heard of them. What is an SDR receiver, and why might you want one over a traditional radio? Or maybe you want to hedge your bets with a superheterodyne or hybrid SDR? We'll help you navigate the pros and cons of each.

To understand each type of receiver, we need to look at their components and characteristics. Here are the three main varieties, though some don't fit neatly into a specific category.

Superheterodyne: A superheterodyne receiver (superhet) is a type of radio receiver that uses frequency mixing to convert a received signal to a fixed intermediate frequency (IF) which can be more easily processed than the original carrier frequency. The traditional superhetrodyne radio works using conventional radio components rather than software.

Here's a block diagram of a typical superhetrodyne (superhet) receiver:



Dual Conversion Superheterodyne Diagram

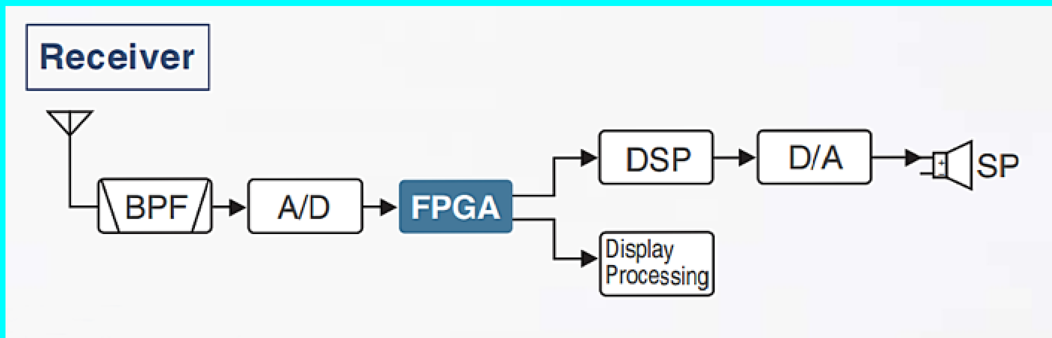
The diagram above shows a dual conversion superheterodyne receiver. They may have more conversion stages and additional circuitry to provide the required levels of performance, like Kenwood's TS-590SG.

A basic superheterodyne starts with the antenna connected to an RF amplifier, which amplifies the very weak signals picked up by the antenna. Some high-end radios put bandpass filters between the antenna and RF amplifier to block strong out-of-band signals. It mixes the incoming signal with a single frequency from the local oscillator to convert the signals to a new frequency.

Next comes the demodulator. This could be for amplitude modulation (AM), single sideband (SSB), frequency modulation (FM), or any other mode. It is also possible to switch between different demodulators according to the mode being received. The final component in the superheterodyne receiver block diagram is an audio amplifier.

Direct Sampling SDR: With a software-defined receiver (SDR), all of the radio control is done via software. Functions such as changing frequency, electing filters, and changing bands are no longer done by the radio hardware itself. The hardware becomes less complex due to the elimination of circuits that would normally be in a traditional superhet radio. With digital circuitry, you reduce noise, distortion, and signal loss found in each successive stage of a superheterodyne. The picture below shows a block diagram of an SDR radio.

The IC-7300 employs an RF direct sampling system where RF signals are directly converted to digital data. Looking over the diagram, you can see that the incoming signal wastes no time going from analog to digital. Received signals are filtered, amplified, and then sent to an analog-to-digital converter (ADC). Then they are fed to a field-programmable gate array (FPGA) for conversion.

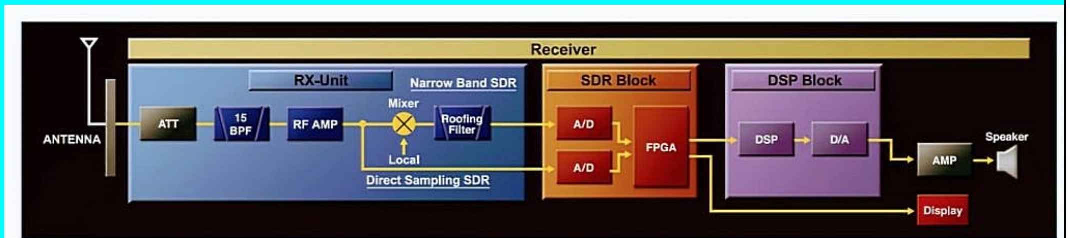


Because frequency conversion is not required, the overall design of a direct RF-sampling receiver is much simpler in comparison to a superheterodyne receiver. The ADC essentially replaces the mixer, oscillator, and the entire IF signal chain found in superheterodyne configurations. Because they have fewer components, direct RF-sampling receivers can be built into more compact radios.

The digital signal processor (DSP) portion of the SDR, which is software operated, does the mixing, filtering, and demodulation that's done by analog hardware in a traditional radio. If you looked at a block diagram of the DSP functions, they would be basically the same as found in a traditional superhet radio. The big advantage is that you can change the various parameters on the fly, such as IF filter width and shape, automatic gain control (AGC), etc.

Hybrids: A hybrid SDR is a radio system that uses a combination of conventional analog components as well as software and digital technologies to process a radio signal. The picture below shows a block diagram of a hybrid radio, the Yaesu FTDX10.

With a hybrid SDR, the RF signal is first amplified and then transformed using an analog circuit to a range that can be processed by the ADC. An amplifier might be added before the ADC to provide some gain. The FPGA then processes the digital output from the ADC, and passes it on to the DSP.



Receiver Block Diagram **FTDX 10**

Pros and Cons: Superheterodyne
Superheterodyne receivers still have a place in the market. The better ones offer excellent selectivity and sensitivity that rival SDR radios. They also are immune to some problems that occur in direct-conversion receivers. But they're slowly being squeezed out of the market due to the added features and continuing price reductions in SDR/Hybrid transceivers.

Pros
IF stages convert high frequency to low frequency, so all signal processing takes place at the lower frequencies–better results.

It is easier to filter an IF signal compared to an RF signal.
It offers excellent receiver sensitivity.

Cons
Requires multiple local oscillators and RF mixers to convert signals from RF to IF before conversion to baseband. This increases overall cost.
Receivers are generally larger in size because they require more components.

Hybrid SDR Pros and Cons
Hybrid SDR design is a practical option given the current state of RF digital technology. High speed and high resolution A/D and D/A converters are still somewhat expensive, and the hybrid architecture is a budget-conscious way to improve receiver performance. This design also combines the strengths of both superheterodyne and SDR receivers, as well as some limited shortcomings.

Pros
A superhet down conversion stage before the A/D conversion stage can provide better dynamic range than a simple direct conversion SDR.

Cons
All analog processing will introduce some noise, and the direct sampling approach eliminates that. On the other hand, the hybrid approach does allow insertion of a roofing filter in front of the A/D converter, which can improve performance.
It does not sample the full spectrum like a direct sampling SDR radio.

SDR Direct RF-Sampling Pros and Cons
The SDR direct RF-sampling receiver basically consists of a low-noise amplifier (LNA), the required filters, and the ADC. The ADC digitizes the RF signal directly and sends it to a processor. An ADC essentially replaces the mixer, oscillator, and the entire IF signal chain found in superheterodyne configurations. Because they have fewer components, direct RF-sampling receivers can be built in smaller packages.

Pros
The ability to receive and transmit various modulation methods using a common set of hardware.
They can be quickly and easily upgraded with enhanced features via software/firmware.
Direct conversion SDRs are exceptionally good at isolating weak signals from adjacent strong signals.
Elimination of higher-cost analog hardware.
Can view a real-time waterfall display of an entire band and see all of the stations operating at one glance.
Recent advances in analog-to-digital converters have enabled them to directly digitize signals at RF frequencies. While operating at high frequencies, they can maintain low noise and good linearity.
SDRs continue to benefit from the simplification of radio designs. Cost of digital parts will continue to fall, yet digital devices will continue to get more powerful.

Cons
If you're used to knobs and dials on a traditional receiver, SDR will require some changes in your operating routine, especially if it's controlled by a PC. However, several manufacturers have models with traditional controls and integrated touch-screen menus.
Receivers still have some limitations regarding the range of frequencies and receiver bandwidth they can support.
Software bugs–fortunately, updates can be easily added.

Flexibility
The idea of a more flexible radio becomes the most obvious and important advantage of SDR/Hybrid radios over classic superheterodynes. The ability to upgrade your system for better performance and for new features means endless possibilities for SDR radios as they are developed.

Another related benefit to SDR is that by making a less complicated RF front-end, there are fewer total parts needed. With digital components like the DSP and FPGA taking the place of many passive and active components, costs become cheaper in the long run.

Using both superheterodyne and SDR hybrid technology together offers the best of both worlds. If you look at the current Sherwood Labs receiver ratings, two of the top three are Yaesu hybrids, the other is a Flex direct conversion SDR. A significant number of others in the top 20 are also various flavors of SDR or hybrid. It's clear that SDR technology adds to the performance of current transceivers, whether alone or in combination with more traditional technology.

The $4.00 Ham Radio VHF/UHF Satellite Antenna

By Dave Tadlock, KG0GG

Simple, inexpensive and lots of fun! Here is an easy to make home brew antenna that can get you on the air working satellites or be built for use as a portable hand held antenna to extend the range of your HT.

It's a dual band 2m/70 cm yagi antenna made with common materials and cost very little to make. Also, the antenna is fed with only one coaxial cable and does not use a duplexer.

For many decades radio amateurs have built antennas with wood and wire and have had great success using their homebrew creations. This antenna was built in the same tradition and I am pleased to say that I made my first satellite contact using such an antenna.

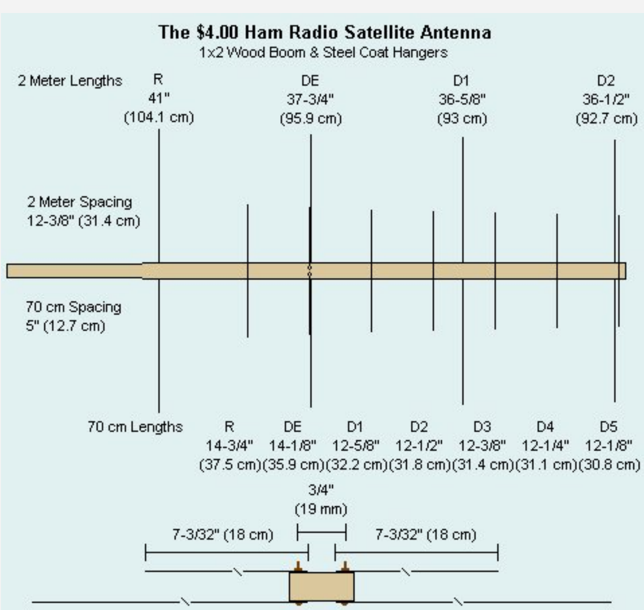
To make this antenna I only needed to buy just a couple of items. Everything else I had on hand. I had to buy the wood for the boom, two 1-1/4" long machine screws (although I bought 4 total) and a package of small wire nuts to place on the ends of the elements just for a bit of safety. Since I already had the screws, coax and connectors I spent less than $4.00 to make this antenna. I have well gotten my money's worth out of it and have thoroughly enjoyed using it!

Construction & Materials

The antenna is made with a 1x2 pine/spruce furring strip for use as a boom and steel coat hangers for antenna elements. I used two trim screws to hold each parasitic element in place and stainless steel #6 machine screws with matching hardware for the driven elements.

Although the dimensions shown in the diagram are for use with steel coat hangers, you can experiment with other materials such as welding rods, stainless steel rods, etc.

he first step was to mark the boom for the elements using a tape measure and a carpenter's square. Some planning ahead of time on paper allowed me to make room for an extra 70 cm director just past the last 2 meter director.



In starting from scratch I began by marking the 2 meter elements on the straightest 1 x 2 x 8' long furring strip that I could find from the lumber yard. An equal spacing of 12-3/8" is what I used for the 2 meter band so that I could add an extra director to give the antenna a little extra gain over a three element yagi and still have a fairly short antenna. That would make the 2 meter yagi antenna length just over three feet long not including the handle.

At first I marked five 2 meter elements on the boom instead of four but after thinking about it I decided that the extra mark was a good spot to cut off the boom. This made the wood boom 50-3/4" (128.9 cm) long.

Starting from the director end of the boom mark the boom as follows. A mark at 1-1/4", 13-5/8", 26", 38-3/8", and 50-3/4" (3.2 cm, 34.6 cm, 66 cm, 97.5 cm & 128.9 cm).

Use a carpenter's square and mark a straight line across the boom at each mark. This will also help to square the coat hanger elements. Cut the boom off at the 50-3/4" (128.9 cm) mark.

Also along each line, mark the center of the boom. Doing this will simplify adding the elements.

Flip the board over, and again starting with the director end of the boom, mark the 70 cm elements as follows. A mark at 1", 6", 11", 16", 21", 26" and 31" (2.5 cm, 15.2 cm, 27.9 cm, 40.6 cm, 53.3 cm, 66 cm & 78.7 cm). After using the square to mark a line across the board, mark the center of the boom along each line.

The next step in preparing the boom is to mark the two holes for the feed-point. The feed-point is located at the 26" (66 cm) mark on the boom. From the center mark on the boom, measure out 3/8" (9.5 mm) in both directions and mark for drilling two holes. The spacing between the two marks should end up being 3/4" (19 mm) apart. If you are using #6 hardware then drill two 9/64" holes through the boom to attach the dipole elements.

Once the boom is marked and the holes are drilled the handle can then be shaped. At the end for the handle trim a little wood off the edges and/or use some sandpaper to smooth out and form a nice handle. Using 80 grit sandpaper will make short work of this.

Four coat hangers will have to be straightened to make the 2 meter elements. If you don't want to straighten all of the coat hangers to make the 70 cm elements then you'll need at least seven more coat hangers. Straighten the coat hangers and cut to the size shown in the diagram.

After cutting the directors and reflectors use a marking pen and mark the center of each element.

Cut the coat hanger wire for the driven elements a couple of inches longer than needed. Bend a loop in one end of the coat hanger wire large enough to wrap around the machine screw. Then measuring from the end of the loop to the end of the element, cut the dipole half to the length shown in the diagram. After making the four dipole halves use sandpaper or a file to remove any enamel or vinyl coating from the ends of the coat hanger elements where the leads are attached to the two halves of the dipole elements. The enamel coating on the parasitic elements does not need to be removed.

The dipole elements are mounted to the boom using #6 stainless steel hardware. A flat washer is first placed on a #6 x 32 x 1-1/4" machine screw. Next goes on the 2 meter element, then the assembly is placed through the hole in the boom. On the opposite side the 70 cm element is placed over the machine screw, then the coaxial cable connection, followed by a flat washer, split lock washer and a nut.

If you cannot get the leads from the coaxial cable to stretch straight across the feed-point then use the shortest length possible. The leads can be connected using crimp on ring connectors or by wrapping the coaxial cable leads directly around the machine screws between two flat washers.

To mount the reflectors and directors to the boom I used some 3/4" long self tapping trim screws. You may instead use any screws with a large head or a screw with a flat washer.

Line up the center mark on the parasitic elements with the center marks on the boom then fasten each element using two screws. You may pre-drill two partial holes 1/8" from the line on the boom for the screws that hold the elements to the boom.

Add a plastic wire nut (twist on wire connector) to each end of all the elements.

The coaxial cable feeds the dipole driven elements at a 90 degree angle. The cable is run along the boom and brought back past the 2 meter reflector then secured with either a plastic tie or vinyl tape. The antenna will not work properly if the cable is allowed to hang down near any of the elements.

Tuning the Antenna
If the antenna is built as shown then it should not need much tuning if any. Tuning is of course by adjusting the lengths of

the dipole elements, making them either shorter or longer as needed. Check the antenna outdoors with an SWR meter or analyzer. If you notice a big problem then most likely it is the connection at the antenna feed-point or possibly the UHF connector (PL-259 or BNC connector).

Parts List
1 each 1 x 2 x 8' Pine/spruce furring strip.
8 to 11 each Steel coat hangers.
18 each Screws with large pan head (or screws and flat washers) to attach directors and reflectors.
25-pack Plastic wire nuts
2 each #6 x 32 x 1-1/4" Stainless steel machine screws.
2 each #6 Stainless steel nuts.
2 each #6 Stainless steel split lock washers.
4 each #6 Stainless steel flat washers.
2 each #6 Crimp on ring connectors.
4 to 12 feet 50 ohm Coaxial cable with UHF or BNC connector.

http://www.amateurradio.bz/4_dollar_satellite_antenna.html

Watch the video: https://youtu.be/Hy_XwvMmIro

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paypal.me/w6rhc

Or by mail to:
GEARS
PO Box 202
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Your dues and contributions support our local repeaters, ARES, and outreach events to keep amatuer radio alive in our area. GEARS also makes donations to support other local repeaters.

GEARS Newsletter edited by Jim Matthews K6EST
JiminChico@yahoo.com